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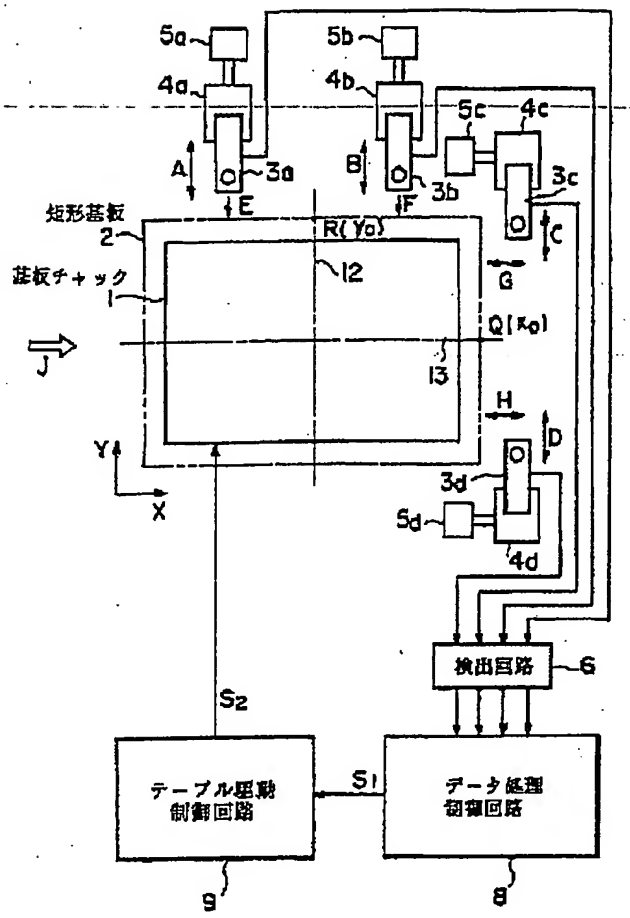
TITLE : POSITIONING DEVICE FOR RECTANGULAR SUBSTRATE



ABSTRACT : PROBLEM TO BE SOLVED: To easily cope with a change in reference line for different positioning at a user's request.

SOLUTION: This device has edge sensors 3a and 3b, and 3c and 3d, which optically detect the peripheral edges of two mutually adjacent sides of the rectangular substrate 2 held on the top surface of a substrate chuck 1, arranged two by two nearby the two mutually adjacent sides of the rectangular substrate chuck 1 at a specific distance. Further, the device is provided with position correcting means 8 and 9 which input position signals of the peripheral edges of the two orthogonal peripheral sides of the rectangular substrate 2 detected by the edge sensors 3a and 3b, and 3c and 3d, recognize their X-directional and Y-directional positions and θ-directional angles, and correct the position of the rectangular substrate 2 about its target position. Then the two edge sensors 3a and 3b, or 3c and 3d are switched and used according to which of the two orthogonal sides of the rectangular substrate 2 is employed as a reference line for recognizing the θ-directional angle of the rectangular substrate 2 to recognize and correct the θ-directional angle of the rectangular substrate 2. Consequently, the change in reference line for different positioning at a user's request can easily be coped with.

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CLAIMS

[Claim(s)]
[Claim 1] 2-dimensional migration of the direction of X, and the direction of Y, and the trolley table which can rotate the direction of theta, It has the substrate chuck of the shape of a rectangle which puts a rectangle substrate on a top face and is held while being fixed to the top face of this trolley table and carrying out migration of X, Y, and the direction of theta with this trolley table. In the pointing device of the rectangle substrate which positions the above-mentioned rectangle substrate to a predetermined target position to the optical system established above this substrate chuck While detaching only predetermined distance and arranging at a time two edge sensors which detect optically the periphery of each side of two sides of phase next door **** rectangular crosses of the rectangle substrate held on the top face of this substrate chuck near each side of two sides of phase next door **** rectangular crosses of the rectangle substrate chuck of the above A location amendment means to incorporate the position signal of the periphery of two sides of rectangular crosses of the rectangle substrate detected with every two above-mentioned edge sensors, to recognize the location of the direction of X and the direction of Y and the include angle of the direction of theta, and to amend a location to the target position of this rectangle substrate is established. Every two above-mentioned edge sensors are used by whether which side of two sides of rectangular crosses of this rectangle substrate is taken as criteria Rhine which recognizes the include angle of the direction of theta of the above-mentioned rectangle substrate, switching them mutually. The pointing device of the rectangle substrate characterized by carrying out recognition and amendment of the rectangle substrate of the include angle of the direction of theta.
[Claim 2] Each above-mentioned edge sensor is the pointing device of the rectangle substrate according to claim 1 characterized by enabling scanning actuation for detecting the periphery of the above-mentioned side optically in the approach location while enabling approach or evacuation to the side where the rectangle substrate held on the top face of a substrate chuck corresponds.
[Claim 3] Each above-mentioned edge sensor is the pointing device of the rectangle substrate according to claim 1 or 2 characterized by being the photo sensor of a transparency mold or a reflective mold.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] In the substrate aligner which can be burned on the rectangle substrates (glass substrate etc.) held on the top face of a substrate chuck in the circuit pattern with which this invention was formed in the mask It is related with the pointing device of the rectangle substrate which positions a rectangle substrate to a predetermined target position to the optical system established above the above-mentioned substrate chuck on the occasion of the alignment of the above-mentioned mask and a rectangle substrate. It is related with the pointing device of the rectangle substrate which can respond to change of criteria Rhine of positioning which changes with user demands in what positions a large-sized rectangle substrate in the state of non-contact especially easily.
[0002]
[Description of the Prior Art] The positioning device of the conventional rectangle substrate has the substrate chuck of the shape of a rectangle which puts a rectangle substrate on a top face and is held while being fixed to the top face of 2-dimensional migration of the direction of X, and the direction of Y, the trolley table which can rotate the direction of theta, and this trolley table and carrying out migration of X, Y, and the direction of theta with this trolley table, and it positions the above-mentioned rectangle substrate to a predetermined target position to the optical system established above this substrate chuck.
[0003] Drawing 4 is the flat-surface explanatory view seen from the top-face side of the rectangle substrate in which the pointing device of the conventional rectangle substrate is shown. In drawing, the rectangle substrates 2, such as a glass substrate [being large-sized (more than 400mmx500mm)], were held by vacuum adsorption etc. on the top face of the rectangle-like substrate chuck 1, and a total of three edge sensors 3a, 3b, and 3c were formed near each side of two sides of phase next door **** rectangular crosses of the above-mentioned substrate chuck 1. These edge sensors 3a, 3b, and 3c are what detects optically the periphery of each side of two sides of phase next door **** rectangular crosses of the rectangle substrate 2 held on the top face of the above-mentioned substrate chuck 1. Along the periphery of one side (for example, long side side), first edge sensor 3a and second edge sensor 3b detach only predetermined distance, it is arranged, and third edge sensor 3c is prepared in the center section of the periphery of the side (for example, shorter side side) of another side which intersects perpendicularly with above-mentioned one side.
[0004] In addition, the approach and evacuation to the rectangle substrate 2 of each above-mentioned edge sensors 3a, 3b, and 3c are enabled like arrow heads A, B, and C by the cylinders 4a, 4b, and 4c attached to each. Moreover, pulse motors 5a, 5b, and 5c are attached to each above-mentioned cylinders 4a, 4b, and 4c, respectively, and scanning actuation for said edge sensors 3a, 3b, and 3c to detect the periphery of the rectangle substrate 2 like arrow heads D, E, and F is enabled. Furthermore, although the illustration abbreviation is carried out in drawing 4 R> 4, the exposure optical system in a substrate aligner or the inspection optical system in substrate test equipment is established above the top face of the rectangle substrate 2.
[0005] In such a pointing device, in order to detect the location of the rectangle substrate 2 and to position to a predetermined target position to the above-mentioned optical system, first, it takes out one rectangle substrate 2 at a time from the loader section by the robot hand of an illustration abbreviation, and conveys in a predetermined path, and as an arrow head J shows to drawing 4 , it sends out, and lays in the top face of the substrate chuck 1. At this time, as the rectangle substrate 2 shows drawing 5 to a predetermined target position by the variation by conveyance of the above-mentioned robot hand, a location gap may be caused.
[0006] Here, from the condition of having approached the rectangle substrate 2 as shown in arrow heads A, B, and C, respectively, each edge sensors 3a, 3b, and 3c shown in drawing 4 carry out scanning actuation still like arrow heads D, E, and F, and detect optically the periphery of each side of two sides of rectangular crosses. That is, as shown in

drawing 5 , first edge sensor 3a detects a point P1 (x1, y1), second edge sensor 3b detects a point P2 (x2, y2), and third edge sensor 3c detects a point P3 (x3, y3). Such signal detection is performed in the detector 6 shown in drawing 4 . In this case, the current position of X shaft orientations of the rectangle substrate 2 detected as mentioned above is the coordinate x3 of a point P3, and the current position of Y shaft orientations is set to (y1+y2) / 2 from the Y coordinate of points P1 and P2. Moreover, similarly angle-of-inclination theta to X shaft orientations of the medial axis 7 of this rectangle substrate 2 is from X of points P1 and P2, and Y coordinate, $\theta = \tan^{-1}\frac{y_1 - y_2}{x_1 - x_2}$ ... (1)

It becomes.

[0007] If the predetermined target position of the above-mentioned rectangle substrate 2 is made into the zero Q of a coordinate x0 by X shaft orientations and it is the zero R of a coordinate y0 by Y shaft orientations in drawing 4 now As shown in drawing 5 , about the rectangle substrate 2 conveyed and laid, the amount of gaps of X shaft orientations is set to (x0-x3), and the amount of gaps of Y shaft orientations is set to {y0- (y1+y2)/2}. Moreover, angle-of-inclination theta to X shaft orientations of this rectangle substrate 2 is as an above-mentioned formula (1). What is necessary is just to make it this amount of gaps serve as zero, since the amount of gaps to the predetermined target position of the rectangle substrate 2 laid by above-mentioned carrying out conveyance by these is known.

[0008] Therefore, each above-mentioned amount of gaps is recognized in the data-processing control circuit 8 shown in drawing 4 , location amendment processing for making it into zero is performed, and the amendment processing signal S1 is sent out to the table drive control circuit 9. And this table drive control circuit 9 sends out the drive control signal S2 to the trolley table (illustration abbreviation) which is supporting said substrate chuck 1, and only the amount corresponding to the above-mentioned amendment processing signal S1 moves in the direction of X, and the direction of Y, and it makes a list rotate this trolley table in the direction of theta. Thereby, in drawing 4 , while the periphery of two sides of rectangular crosses of the above-mentioned rectangle substrate 2 is in agreement with Zeros Q and R, respectively, it becomes zero, and an inclination also agrees in a predetermined target position and is positioned in it.

[0009] In the case of above-mentioned drawing 4 , two edge sensors 3a and 3b are formed in this side side as criteria Rhine which recognizes angle-of-inclination theta [as opposed to X shaft orientations for the long side side of two sides of rectangular crosses of the rectangle substrate 2], but it may be specified as criteria Rhine which recognizes angle-of-inclination theta [as opposed to X shaft orientations for the shorter side side of two sides of rectangular crosses of the above-mentioned rectangle substrate 2] depending on a demand of a user. At this time, as shown in drawing 6 , first edge sensor 3a will be prepared in the center section by the side of the long side of two sides of rectangular crosses of the above-mentioned rectangle substrate 2, and only predetermined distance will detach and arrange second edge sensor 3b and third edge sensor 3c along with the shorter side side of two sides of rectangular crosses of this rectangle substrate 2.

[0010] The account of a top when each edge sensors 3a, 3b, and 3c have been arranged according to a different user demand First edge sensor 3a detects a point P1 (x1, y1) about one by the side of a long side, second edge sensor 3b detects a point P2 (x2, y2) about certain one by the side of a shorter side, and third edge sensor 3c detects a point P3 (x3, y3) about other one by the side of a shorter side. At this time, the current position of X shaft orientations of the rectangle substrate 2 detected as mentioned above is set to (x2+x3) / 2 from the X coordinate of points P2 and P3, and the current position of Y shaft orientations is the coordinate y1 of a point P1. Moreover, make angle-of-inclination theta to X shaft orientations of the medial axis 7 of this rectangle substrate 2 be the same as that of a formula (1) from X of the points P2 and P3 describing above, and Y coordinate. $\theta = \tan^{-1}\frac{x_2 - x_3}{y_2 - y_3}$ ... (2)

It becomes.

[0011] If the predetermined target position of the above-mentioned rectangle substrate 2 is made into the zero Q of a coordinate x0 by X shaft orientations as shown at drawing 4 in the case of this drawing 6 , and it is the zero R of a coordinate y0 in Y shaft orientations As shown in drawing 6 , about the rectangle substrate 2 conveyed and laid, the amount of gaps of X shaft orientations is set to {x0- (x2+x3)/2}, and the amount of gaps of Y shaft orientations is set to (y0-y1). Moreover, angle-of-inclination theta to X shaft orientations of this rectangle substrate 2 is as an above-mentioned formula (2). Since the amount of gaps to the predetermined target position of the rectangle substrate 2 laid by above-mentioned carrying out conveyance by these is known, location amendment processing is performed like the above-mentioned in the data-processing circuit 8 and the table drive control circuit 9 so that this amount of gaps may serve as zero. Thereby, it is agreed and positioned in a predetermined target position.

[0012]

[Problem(s) to be Solved by the Invention] However, it sets to the pointing device of such a conventional rectangle

substrate. As shown in drawing 4 , only predetermined distance detaches and arranges two edge sensors 3a and 3b along the periphery of one side of two sides of phase next door **** rectangular crosses of the substrate chuck 1. Since one edge sensor 3c was prepared in the center section of the periphery of the side of another side which intersects perpendicularly with the side of the method of top Norikazu The correspondence was not easy when criteria Rhine which recognizes angle-of-inclination theta to X shaft orientations of the rectangle substrate 2 by the difference of a user demand changed in one side and the side of another side, as shown in drawing 5 and drawing 6 . That is, in order to have recognized angle-of-inclination theta to X shaft orientations of the above-mentioned rectangle substrate 2, two edge sensors must be arranged to the side in which the criteria Rhine is located, but when criteria Rhine of angle-of-inclination theta changed with the differences of a user demand, the design change of whether two edge sensors are arranged had to be carried out, and the attaching position had to be changed into which side side of two sides of rectangular crosses each time. Moreover, the formula of the location amendment processing program in the data-processing control circuit 8 shown in drawing 4 also had to be changed. Therefore, while it was complicated to have dealt with change of criteria Rhine of positioning by the difference of the above-mentioned user demand, it was difficult, and time amount was also taken, and costs were also these things. Moreover, in edge sensor 3c prepared in one shorter side side shown in drawing 4 , it was what approach of the direction of arrow-head C or the movement magnitude of evacuation must move greatly from the 1 side side of the rectangle substrate 2 to a medial axis, and the device large-sized-izes.

[0013] Then, this invention copes with such a trouble and aims at offering the pointing device of the rectangle substrate which can respond to change of criteria Rhine of positioning which changes with user demands in what positions a large-sized rectangle substrate in the state of non-contact easily.

[0014]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the pointing device of the rectangle substrate by this invention 2-dimensional migration of the direction of X, and the direction of Y, and the trolley table which can rotate the direction of theta, It has the substrate chuck of the shape of a rectangle which puts a rectangle substrate on a top face and is held while being fixed to the top face of this trolley table and carrying out migration of X, Y, and the direction of theta with this trolley table. In the pointing device of the rectangle substrate which positions the above-mentioned rectangle substrate to a predetermined target position to the optical system established above this substrate chuck While detaching only predetermined distance and arranging at a time two edge sensors which detect optically the periphery of each side of two sides of phase next door **** rectangular crosses of the rectangle substrate held on the top face of this substrate chuck near each side of two sides of phase next door **** rectangular crosses of the rectangle substrate chuck of the above A location amendment means to incorporate the position signal of the periphery of two sides of rectangular crosses of the rectangle substrate detected with every two above-mentioned edge sensors, to recognize the location of the direction of X and the direction of Y and the include angle of the direction of theta, and to amend a location to the target position of this rectangle substrate is established. Every two above-mentioned edge sensors are used by whether which side of two sides of rectangular crosses of this rectangle substrate is taken as criteria Rhine which recognizes the include angle of the direction of theta of the above-mentioned rectangle substrate, switching them mutually, and it is made to carry out recognition and amendment of the rectangle substrate of the include angle of the direction of theta.

[0015] Moreover, each above-mentioned edge sensor enables scanning actuation for detecting the periphery of the above-mentioned side optically in the approach location while enabling approach or evacuation to the side where the rectangle substrate held on the top face of a substrate chuck corresponds.

[0016] Furthermore, let each above-mentioned edge sensor be the photo sensor of a transparency mold or a reflective mold.

[0017]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail based on an accompanying drawing. Drawing 1 is the flat-surface explanatory view seen from the top-face side of the rectangle substrate in which the operation gestalt of the pointing device of the rectangle substrate by this invention is shown, and drawing 2 is the transverse-plane explanatory view which looked at the substrate chuck from the transverse-plane side. In the substrate aligner which can be burned on the rectangle substrates (glass substrate etc.) held on the top face of a substrate chuck in the circuit pattern with which the positioning device of this rectangle substrate was formed in the mask It is what positions a rectangle substrate to a predetermined target position to the optical system established above the above-mentioned substrate chuck on the occasion of the alignment of the above-mentioned mask and a rectangle substrate. As shown in drawing 1 and drawing 2 , it has a trolley table 10, the substrate chuck 1, edge sensors 3a, 3b, 3c, and 3d, the data-processing circuit 7, and the table drive control circuit 8, and changes.

[0018] In drawing 2 , rotation of 2-dimensional migration of the direction of X and the direction of Y and the direction of theta of a trolley table 10 is enabled in a horizontal plane by the driving source besides illustration, and X table which moves in the direction of X, Y table which moves in the direction of Y, and theta table which rotates in the direction of theta are accumulated up and down. The substrate chuck 1 is being fixed to the top face of the above-mentioned trolley table 10. The rectangle substrate 2 is put on that top face, and this substrate chuck 1 is held, and as shown in drawing 1 , it is formed in the shape of a rectangle, while migration of X, Y, and the direction of theta is carried out with the above-mentioned trolley table 10. In addition, although the illustration abbreviation was carried out, two or more vacuum suction holes for carrying out adsorption maintenance of the above-mentioned rectangle substrate 2 are prepared in the top face of this substrate chuck 1 at proper spacing. Moreover, the above-mentioned rectangle substrate 2 is a large-sized glass substrate beyond 400mmx500mm, and the periphery section has projected it outside the perimeter of the substrate chuck 1, as shown in drawing 1 and drawing 2 .

[0019] Optical system 11 is established above the above-mentioned substrate chuck 1. This optical system 11 is exposure optical system in a substrate aligner, is inspection optical system in substrate test equipment, and it is constituted so that a focus may be connected on the field of the rectangle substrate 2 by which installation maintenance is carried out on the top face of the substrate chuck 1.

[0020] Here, in this invention, near [each] each side of two sides of phase next door **** rectangular crosses of the rectangle substrate chuck 1 of the above, only predetermined distance separates mutually and edge sensor 3a, 3b;3c, and two 3d are arranged. These edge sensors 3a-3d are what detects optically the periphery of each side of two sides of phase next door **** rectangular crosses of the rectangle substrate 2 held on the top face of the above-mentioned substrate chuck 1. For example, along with the long side side of the above-mentioned rectangle substrate 2, first edge sensor 3a and second edge sensor 3b are prepared in the medial axis 12 of Y shaft orientations at the symmetry. Along with the shorter side side of this rectangle substrate 2, third edge sensor 3c and fourth edge sensor 3d are prepared in the medial axis 13 of X shaft orientations at the symmetry. As shown in drawing 2 , as the floodlighting section 14 and a light sensing portion 15 sandwiched the periphery section of the rectangle substrate 2, they have countered up and down, respectively, and each above-mentioned edge sensors 3a-3d operate by irradiating a laser beam downward from the above-mentioned floodlighting section 14, receiving light by the light sensing portion 15, and intercepting this exposure laser beam in the periphery of the above-mentioned rectangle substrate 2 so that that location may be detected.

[0021] in addition, the above-mentioned each edge sensor 3a, 3b;3c, cylinder 4a that was alike 3d, respectively and was attached, and 4b;4c -- the approach and evacuation to the rectangle substrate 2 are enabled by 4d like arrow heads A, B, C, and D. Moreover, pulse motor 5a, 5b;5c, and 5d are attached to each above-mentioned cylinder 4a, 4b;4c, and 4d, respectively, and scanning actuation for said edge sensor 3a, 3b;3c, and 3d to detect the periphery of the rectangle substrate 2 like an arrow head E, F;G, and H is enabled. Furthermore, the detecting signal detected by each above-mentioned edge sensor 3a, 3b;3c, and 3d is incorporated in the detector 6 shown in drawing 1 R> 1. In addition, this detector 6 is classified corresponding to each above-mentioned edge sensors 3a-3d, and delivers a detecting signal by 1 to 1.

[0022] Moreover, the data-processing control circuit 8 and the table drive control circuit 9 are established in the output side of the above-mentioned detector 6. The above-mentioned data-processing control circuit 8 inputs an each edge sensors [which were incorporated in the detector 6 / 3a-3d] detecting signal, and recognizes the location of the direction of X, and the direction of Y, and the include angle of the direction of theta about two sides of predetermined rectangular crosses of said rectangle substrate 2. While recognizing the amount of gaps to a predetermined target position, location amendment processing for making it into zero is performed, MPU, memory, etc. as a processing unit are prepared in the interior, and the amendment processing signal S1 is outputted. The amendment processing signal S1 outputted from the above-mentioned data-processing control circuit 8 is inputted, only the amount corresponding to this amendment processing signal S1 moves said trolley table 10 in X, Y, and the direction of theta, and the table drive control circuit 9 sends out the drive control signal S2 to the above-mentioned trolley table 10.

[0023] And a location amendment means to incorporate the position signal of the periphery of two sides of rectangular crosses of the rectangle substrate 2 detected by every two above-mentioned edge sensor 3a, 3b;3c, and 3d, to recognize the location of the direction of X and the direction of Y and the include angle of the direction of theta, and to amend a location to the target position of this rectangle substrate 2 in the above-mentioned data-processing control circuit 8 and the table drive control circuit 9 is constituted.

[0024] Next, actuation of the pointing device of the rectangle substrate by this invention constituted in this way is explained with reference to drawing 1 - drawing 3 . First, it takes out one rectangle substrate 2 at a time from the loader section by the robot hand of an illustration abbreviation, and conveys in a predetermined path, as an arrow head J shows

to drawing 1 , it sends out, and it lays in the top face of the substrate chuck 1. At this time, as the rectangle substrate 2 shows drawing 3 to a predetermined target position by the variation by conveyance of the above-mentioned robot hand, a location gap may be caused.

[0025] Next, each edge sensor 3a shown in drawing 1 , 3b;3c, and 3d, from the condition of having approached the rectangle substrate 2 as shown in arrow heads A, B, C, and D, respectively, scanning actuation is carried out still like arrow heads E, F, G, and H, and the periphery of each side of two sides of rectangular crosses is detected optically. That is, as shown in drawing 3 , first edge sensor 3a detects a point P1 (x1, y1), second edge sensor 3b detects a point P2 (x2, y2), third edge sensor 3c detects a point P3 (x3, y3), and a point P4 (x4, y4) is detected edge sensor 3d of the fourth **. And such signal detection is performed in the detector 6 shown in drawing 1 .

[0026] When it is criteria Rhine which recognizes now angle-of-inclination theta [as opposed to X shaft orientations for the long side side of two sides of rectangular crosses of the rectangle substrate 2 shown in drawing 1], in this case The current position of X shaft orientations of the rectangle substrate 2 detected as shown in drawing 3 is set to (x3+x4) / 2 from the X coordinate of points P3 and P4, and the current position of Y shaft orientations is set to (y1+y2) / 2 from the Y coordinate of points P1 and P2. Moreover, similarly angle-of-inclination theta to X shaft orientations (sign 13 reference) of the medial axis 7 of this rectangle substrate 2 is from X of points P1 and P2, and Y coordinate,

$$\vartheta = \tan^{-1}\frac{y_1 - y_2}{x_1 - x_2} \quad \cdots (3)$$

It becomes. In addition, this formula (3) is completely the same as the above-mentioned formula (1).

[0027] Moreover, if the predetermined target position of the above-mentioned rectangle substrate 2 is made into the zero Q of a coordinate x0 by X shaft orientations and it is the zero R of a coordinate y0 by Y shaft orientations in drawing 1 As shown in drawing 3 , about the rectangle substrate 2 conveyed and laid, the amount of gaps of X shaft orientations is set to {x0- (x3+x4)/2}, and the amount of gaps of Y shaft orientations is set to {y0- (y1+y2)/2}. And angle-of-inclination theta to X shaft orientations of this rectangle substrate 2 is as an above-mentioned formula (3). What is necessary is just to make it this amount of gaps serve as zero, since the amount of gaps to the predetermined target position of the rectangle substrate 2 laid by above-mentioned carrying out conveyance by these is known.

[0028] Therefore, each above-mentioned amount of gaps is recognized in the data-processing control circuit 8 shown in drawing 1 , location amendment processing for making it into zero is performed, and the amendment processing signal S1 is sent out to the table drive control circuit 9. And this table drive control circuit 9 sends out the drive control signal S2 to the trolley table 10 (refer to drawing 2) which is supporting said substrate chuck 1, and only the amount corresponding to the above-mentioned amendment processing signal S1 moves in the direction of X, and the direction of Y, and it makes a list rotate this trolley table in the direction of theta. Thereby, in drawing 1 , while the periphery of two sides of rectangular crosses of the above-mentioned rectangle substrate 2 is in agreement with Zeros Q and R, respectively, it becomes zero, and an inclination also agrees in a predetermined target position and is positioned in it.

[0029] Next, the case where it is specified as criteria Rhine which recognizes angle-of-inclination theta [as opposed to X shaft orientations for the shorter side side of two sides of rectangular crosses of the above-mentioned rectangle substrate 2] by demand of a user unlike an above-mentioned case is explained. Since every two edge sensor 3a, 3b;3c, and 3d are beforehand prepared in the long side [of two sides of rectangular crosses of the rectangle substrate 2], and shorter side side unlike the former at this time as shown in drawing 1 R> 1, it is not necessary to reshuffle the personnel especially by the design change. Therefore, each edge sensor 3a, 3b;3c, and 3d detect optically the periphery of each side of two sides of rectangular crosses of the rectangle substrate 2 like last time. The current position of X shaft orientations of the rectangle substrate 2 detected as shown in drawing 3 also in this case is set to (x3+x4) / 2 from the X coordinate of points P3 and P4, and the current position of Y shaft orientations is set to (y1+y2) / 2 from the Y coordinate of points P1 and P2. Moreover, for angle-of-inclination theta to X shaft orientations (sign 13 reference) of the medial axis 7 of this rectangle substrate 2, next time is from X of the points P3 and P4 describing above, and Y coordinate,

$$\theta = \tan^{-1}\frac{x_3 - x_4}{y_3 - y_4} \quad \cdots (4)$$

It becomes. Namely, what is necessary is just to use it for third edge sensor 3c and fourth edge sensor 3d in this case, switching as an object for detection of angle-of-inclination theta.

[0030] Also in this case, if the predetermined target position of the above-mentioned rectangle substrate 2 is made into the zero Q of a coordinate x0 by X shaft orientations and it is the zero R of a coordinate y0 by Y shaft orientations in drawing 1 Like [substrate / 2 / which was conveyed and laid as shown in drawing 3 / rectangle] the above-mentioned, the amount of gaps of X shaft orientations is set to {x0- (x3+x4)/2}, and the amount of gaps of Y shaft orientations is set to {y0- (y1+y2)/2}. And angle-of-inclination theta to X shaft orientations of this rectangle substrate 2 is as an above-

mentioned formula (4). Since the amount of gaps to the predetermined target position of the rectangle substrate 2 laid by above-mentioned carrying out conveyance by these is known, location amendment processing is performed like the above-mentioned in the data-processing circuit 8 and the table drive control circuit 9 so that this amount of gaps may serve as zero. Thereby, it is agreed and positioned in a predetermined target position.

[0031] As mentioned above, according to the pointing device of the rectangle substrate by this invention, every two above-mentioned edge sensor 3a, 3b;3c, and a 3d group can be used by whether which side of two sides of rectangular crosses of this rectangle substrate 2 is taken as criteria Rhine which recognizes the include angle of the direction of theta of the target rectangle substrate 2 to position, switching them mutually, and recognition and amendment of the rectangle substrate 2 of the include angle of the direction of theta can be carried out.

[0032] In addition, in the above explanation, although each edge sensors 3a-3d were made into the photo sensor of the transparency mold which isolated between predetermined and the floodlighting section 14 and a light sensing portion 15 were made to counter up and down, this invention is good [the edge sensors] also as a photo sensor of the reflective mold which adjoins and forms not only this but the floodlighting section 14, and a light sensing portion 15 in the same side side of the rectangle substrate 2, and received the reflected light. Moreover, without being limited to this, it fixes to the home position where the rectangle substrate 2 should position each above-mentioned edge sensors 3a-3d, and it moves the above-mentioned substrate chuck 1, and you may make it amend the location of the above-mentioned rectangle substrate 2 in drawing 1 , although the substrate chuck 1 does not move greatly, but moves each edge sensors 3a-3d to the rectangle substrate 2 side and he is trying to detect the periphery.

[0033]

[Effect of the Invention] Since this invention was constituted as mentioned above, while detaching only predetermined distance and arranging at a time two edge sensors which detect optically the periphery of each side of two sides of phase next door **** rectangular crosses of the rectangle substrate held on the top face of this substrate chuck near each side of two sides of phase next door **** rectangular crosses of a rectangle-like substrate chuck By having established a location amendment means to have incorporated the position signal of the periphery of two sides of rectangular crosses of the rectangle substrate detected with every two above-mentioned edge sensors, to have recognized the location of the direction of X, and the direction of Y, and the include angle of the direction of theta, and to amend a location to the target position of this rectangle substrate Every two above-mentioned edge sensors can be used by whether which side of two sides of rectangular crosses of this rectangle substrate is taken as criteria Rhine which recognizes the include angle of the direction of theta of the above-mentioned rectangle substrate, switching them mutually, and recognition and amendment of the rectangle substrate of the include angle of the direction of theta can be carried out. Therefore, when criteria Rhine of angle-of-inclination theta changes with the differences of a user demand, it is not necessary like before to carry out the design change of whether two edge sensors are arranged, and to change the attaching position into which side side of two sides of rectangular crosses each time. Moreover, it is not necessary to also change the formula in the data-processing control circuit shown in drawing 1 (for example, a location amendment processing program). From this, according to the pointing device of the rectangle substrate by this invention, it can respond to change of criteria Rhine of positioning which changes with user demands easily in a short time, and costs can also be reduced further.

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TECHNICAL FIELD

[Field of the Invention] In the substrate aligner which can be burned on the rectangle substrates (glass substrate etc.) held on the top face of a substrate chuck in the circuit pattern with which this invention was formed in the mask It is related with the pointing device of the rectangle substrate which positions a rectangle substrate to a predetermined target position to the optical system established above the above-mentioned substrate chuck on the occasion of the alignment of the above-mentioned mask and a rectangle substrate. It is related with the pointing device of the rectangle substrate which can respond to change of criteria Rhine of positioning which changes with user demands in what positions a large-sized rectangle substrate in the state of non-contact especially easily.

[Translation done.]

* NOTICES *

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PRIOR ART

[Description of the Prior Art] The positioning device of the conventional rectangle substrate has the substrate chuck of the shape of a rectangle which puts a rectangle substrate on a top face and is held while being fixed to the top face of 2-dimensional migration of the direction of X, and the direction of Y, the trolley table which can rotate the direction of theta, and this trolley table and carrying out migration of X, Y, and the direction of theta with this trolley table, and it positions the above-mentioned rectangle substrate to a predetermined target position to the optical system established above this substrate chuck.

[0003] Drawing 4 is the flat-surface explanatory view seen from the top-face side of the rectangle substrate in which the pointing device of the conventional rectangle substrate is shown. In drawing, the rectangle substrates 2, such as a glass substrate [being large-sized (more than 400mmx500mm)], were held by vacuum adsorption etc. on the top face of the rectangle-like substrate chuck 1, and a total of three edge sensors 3a, 3b, and 3c were formed near each side of two sides of phase next door **** rectangular crosses of the above-mentioned substrate chuck 1. These edge sensors 3a, 3b, and 3c are what detects optically the periphery of each side of two sides of phase next door **** rectangular crosses of the rectangle substrate 2 held on the top face of the above-mentioned substrate chuck 1. Along the periphery of one side (for example, long side side), first edge sensor 3a and second edge sensor 3b detach only predetermined distance, it is arranged, and third edge sensor 3c is prepared in the center section of the periphery of the side (for example, shorter side side) of another side which intersects perpendicularly with above-mentioned one side.

[0004] In addition, the approach and evacuation to the rectangle substrate 2 of each above-mentioned edge sensors 3a, 3b, and 3c are enabled like arrow heads A, B, and C by the cylinders 4a, 4b, and 4c attached to each. Moreover, pulse motors 5a, 5b, and 5c are attached to each above-mentioned cylinders 4a, 4b, and 4c, respectively, and scanning actuation for said edge sensors 3a, 3b, and 3c to detect the periphery of the rectangle substrate 2 like arrow heads D, E, and F is enabled. Furthermore, although the illustration abbreviation is carried out in drawing 4 R> 4, the exposure optical system in a substrate aligner or the inspection optical system in substrate test equipment is established above the top face of the rectangle substrate 2.

[0005] In such a pointing device, in order to detect the location of the rectangle substrate 2 and to position to a predetermined target position to the above-mentioned optical system, first, it takes out one rectangle substrate 2 at a time from the loader section by the robot hand of an illustration abbreviation, and conveys in a predetermined path, and as an arrow head J shows to drawing 4 , it sends out, and lays in the top face of the substrate chuck 1. At this time, as the rectangle substrate 2 shows drawing 5 to a predetermined target position by the variation by conveyance of the above-mentioned robot hand, a location gap may be caused.

[0006] Here, from the condition of having approached the rectangle substrate 2 as shown in arrow heads A, B, and C, respectively, each edge sensors 3a, 3b, and 3c shown in drawing 4 carry out scanning actuation still like arrow heads D, E, and F, and detect optically the periphery of each side of two sides of rectangular crosses. That is, as shown in drawing 5 , first edge sensor 3a detects a point P1 (x1, y1), second edge sensor 3b detects a point P2 (x2, y2), and third edge sensor 3c detects a point P3 (x3, y3). Such signal detection is performed in the detector 6 shown in drawing 4 . In this case, the current position of X shaft orientations of the rectangle substrate 2 detected as mentioned above is the coordinate x3 of a point P3, and the current position of Y shaft orientations is set to (y1+y2) / 2 from the Y coordinate of points P1 and P2. Moreover, similarly angle-of-inclination theta to X shaft orientations of the medial axis 7 of this rectangle substrate 2 is from X of points P1 and P2, and Y coordinate, $\theta = \tan^{-1}\frac{y_1 - y_2}{x_1 - x_2}$ ... (1)

It becomes.

[0007] If the predetermined target position of the above-mentioned rectangle substrate 2 is made into the zero Q of a coordinate x0 by X shaft orientations and it is the zero R of a coordinate y0 by Y shaft orientations in drawing 4 now As

shown in drawing 5 , about the rectangle substrate 2 conveyed and laid, the amount of gaps of X shaft orientations is set to (x0-x3), and the amount of gaps of Y shaft orientations is set to {y0- (y1+y2)/2}. Moreover, angle-of-inclination theta to X shaft orientations of this rectangle substrate 2 is as an above-mentioned formula (1). What is necessary is just to make it this amount of gaps serve as zero, since the amount of gaps to the predetermined target position of the rectangle substrate 2 laid by above-mentioned carrying out conveyance by these is known.

[0008] Therefore, each above-mentioned amount of gaps is recognized in the data-processing control circuit 8 shown in drawing 4 , location amendment processing for making it into zero is performed, and the amendment processing signal S1 is sent out to the table drive control circuit 9. And this table drive control circuit 9 sends out the drive control signal S2 to the trolley table (illustration abbreviation) which is supporting said substrate chuck 1, and only the amount corresponding to the above-mentioned amendment processing signal S1 moves in the direction of X, and the direction of Y, and it makes a list rotate this trolley table in the direction of theta. Thereby, in drawing 4 , while the periphery of two sides of rectangular crosses of the above-mentioned rectangle substrate 2 is in agreement with Zeros Q and R, respectively, it becomes zero, and an inclination also agrees in a predetermined target position and is positioned in it.

[0009] In the case of above-mentioned drawing 4 , two edge sensors 3a and 3b are formed in this side side as criteria Rhine which recognizes angle-of-inclination theta [as opposed to X shaft orientations for the long side side of two sides of rectangular crosses of the rectangle substrate 2], but it may be specified as criteria Rhine which recognizes angle-of-inclination theta [as opposed to X shaft orientations for the shorter side side of two sides of rectangular crosses of the above-mentioned rectangle substrate 2] depending on a demand of a user. At this time, as shown in drawing 6 , first edge sensor 3a will be prepared in the center section by the side of the long side of two sides of rectangular crosses of the above-mentioned rectangle substrate 2, and only predetermined distance will detach and arrange second edge sensor 3b and third edge sensor 3c along with the shorter side side of two sides of rectangular crosses of this rectangle substrate 2.

[0010] The account of a top when each edge sensors 3a, 3b, and 3c have been arranged according to a different user demand First edge sensor 3a detects a point P1 (x1, y1) about one by the side of a long side, second edge sensor 3b detects a point P2 (x2, y2) about certain one by the side of a shorter side, and third edge sensor 3c detects a point P3 (x3, y3) about other one by the side of a shorter side. At this time, the current position of X shaft orientations of the rectangle substrate 2 detected as mentioned above is set to (x2+x3) / 2 from the X coordinate of points P2 and P3, and the current position of Y shaft orientations is the coordinate y1 of a point P1. Moreover, make angle-of-inclination theta to X shaft orientations of the medial axis 7 of this rectangle substrate 2 be the same as that of a formula (1) from X of the points P2 and P3 describing above, and Y coordinate. $$\theta = \tan^{-1}\frac{x_2 - x_3}{y_2 - y_3} \quad \cdots (2)$$

It becomes.

[0011] If the predetermined target position of the above-mentioned rectangle substrate 2 is made into the zero Q of a coordinate x0 by X shaft orientations as shown at drawing 4 in the case of this drawing 6 , and it is the zero R of a coordinate y0 in Y shaft orientations As shown in drawing 6 , about the rectangle substrate 2 conveyed and laid, the amount of gaps of X shaft orientations is set to {x0- (x2+x3)/2}, and the amount of gaps of Y shaft orientations is set to (y0-y1). Moreover, angle-of-inclination theta to X shaft orientations of this rectangle substrate 2 is as an above-mentioned formula (2). Since the amount of gaps to the predetermined target position of the rectangle substrate 2 laid by above-mentioned carrying out conveyance by these is known, location amendment processing is performed like the above-mentioned in the data-processing circuit 8 and the table drive control circuit 9 so that this amount of gaps may serve as zero. Thereby, it is agreed and positioned in a predetermined target position.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] Since this invention was constituted as mentioned above, while detaching only predetermined distance and arranging at a time two edge sensors which detect optically the periphery of each side of two sides of phase next door **** rectangular crosses of the rectangle substrate held on the top face of this substrate chuck near each side of two sides of phase next door **** rectangular crosses of a rectangle-like substrate chuck By having established a location amendment means to have incorporated the position signal of the periphery of two sides of rectangular crosses of the rectangle substrate detected with every two above-mentioned edge sensors, to have recognized the location of the direction of X, and the direction of Y, and the include angle of the direction of theta, and to amend a location to the target position of this rectangle substrate Every two above-mentioned edge sensors can be used by whether which side of two sides of rectangular crosses of this rectangle substrate is taken as criteria Rhine which recognizes the include angle of the direction of theta of the above-mentioned rectangle substrate, switching them mutually, and recognition and amendment of the rectangle substrate of the include angle of the direction of theta can be carried out. Therefore, when criteria Rhine of angle-of-inclination theta changes with the differences of a user demand, it is not necessary like before to carry out the design change of whether two edge sensors are arranged, and to change the attaching position into which side side of two sides of rectangular crosses each time. Moreover, it is not necessary to also change the formula in the data-processing control circuit shown in drawing 1 (for example, a location amendment processing program). From this, according to the pointing device of the rectangle substrate by this invention, it can respond to change of criteria Rhine of positioning which changes with user demands easily in a short time, and costs can also be reduced further.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, it sets to the pointing device of such a conventional rectangle substrate. As shown in drawing 4 , only predetermined distance detaches and arranges two edge sensors 3a and 3b along the periphery of one side of two sides of phase next door **** rectangular crosses of the substrate chuck 1. Since one edge sensor 3c was prepared in the center section of the periphery of the side of another side which intersects perpendicularly with the side of the method of top Norikazu The correspondence was not easy when criteria Rhine which recognizes angle-of-inclination theta to X shaft orientations of the rectangle substrate 2 by the difference of a user demand changed in one side and the side of another side, as shown in drawing 5 and drawing 6 . That is, in order to have recognized angle-of-inclination theta to X shaft orientations of the above-mentioned rectangle substrate 2, two edge sensors must be arranged to the side in which the criteria Rhine is located, but when criteria Rhine of angle-of-inclination theta changed with the differences of a user demand, the design change of whether two edge sensors are arranged had to be carried out, and the attaching position had to be changed into which side side of two sides of rectangular crosses each time. Moreover, the formula of the location amendment processing program in the data-processing control circuit 8 shown in drawing 4 also had to be changed. Therefore, while it was complicated to have dealt with change of criteria Rhine of positioning by the difference of the above-mentioned user demand, it was difficult, and time amount was also taken, and costs were also these things. Moreover, in edge sensor 3c prepared in one shorter side side shown in drawing 4 , it was what approach of the direction of arrow-head C or the movement magnitude of evacuation must move greatly from the 1 side side of the rectangle substrate 2 to a medial axis, and the device large-sized-izes.
[0013] Then, this invention copes with such a trouble and aims at offering the pointing device of the rectangle substrate which can respond to change of criteria Rhine of positioning which changes with user demands in what positions a large-sized rectangle substrate in the state of non-contact easily.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the pointing device of the rectangle substrate by this invention 2-dimensional migration of the direction of X, and the direction of Y, and the trolley table which can rotate the direction of theta, It has the substrate chuck of the shape of a rectangle which puts a rectangle substrate on a top face and is held while being fixed to the top face of this trolley table and carrying out migration of X, Y, and the direction of theta with this trolley table. In the pointing device of the rectangle substrate which positions the above-mentioned rectangle substrate to a predetermined target position to the optical system established above this substrate chuck While detaching only predetermined distance and arranging at a time two edge sensors which detect optically the periphery of each side of two sides of phase next door **** rectangular crosses of the rectangle substrate held on the top face of this substrate chuck near each side of two sides of phase next door **** rectangular crosses of the rectangle substrate chuck of the above A location amendment means to incorporate the position signal of the periphery of two sides of rectangular crosses of the rectangle substrate detected with every two above-mentioned edge sensors, to recognize the location of the direction of X and the direction of Y and the include angle of the direction of theta, and to amend a location to the target position of this rectangle substrate is established. Every two above-mentioned edge sensors are used by whether which side of two sides of rectangular crosses of this rectangle substrate is taken as criteria Rhine which recognizes the include angle of the direction of theta of the above-mentioned rectangle substrate, switching them mutually, and it is made to carry out recognition and amendment of the rectangle substrate of the include angle of the direction of theta.
[0015] Moreover, each above-mentioned edge sensor enables scanning actuation for detecting the periphery of the above-mentioned side optically in the approach location while enabling approach or evacuation to the side where the rectangle substrate held on the top face of a substrate chuck corresponds.
[0016] Furthermore, let each above-mentioned edge sensor be the photo sensor of a transparency mold or a reflective mold.
[0017]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail based on an accompanying drawing. Drawing 1 is the flat-surface explanatory view seen from the top-face side of the rectangle substrate in which the operation gestalt of the pointing device of the rectangle substrate by this invention is shown, and drawing 2 is the transverse-plane explanatory view which looked at the substrate chuck from the transverse-plane side. In the substrate aligner which can be burned on the rectangle substrates (glass substrate etc.) held on the top face of a substrate chuck in the circuit pattern with which the positioning device of this rectangle substrate was formed in the mask It is what positions a rectangle substrate to a predetermined target position to the optical system established above the above-mentioned substrate chuck on the occasion of the alignment of the above-mentioned mask and a rectangle substrate. As shown in drawing 1 and drawing 2 , it has a trolley table 10, the substrate chuck 1, edge sensors 3a, 3b, 3c, and 3d, the data-processing circuit 7, and the table drive control circuit 8, and changes.
[0018] In drawing 2 , rotation of 2-dimensional migration of the direction of X and the direction of Y and the direction of theta of a trolley table 10 is enabled in a horizontal plane by the driving source besides illustration, and X table which moves in the direction of X, Y table which moves in the direction of Y, and theta table which rotates in the direction of theta are accumulated up and down. The substrate chuck 1 is being fixed to the top face of the above-mentioned trolley table 10. The rectangle substrate 2 is put on that top face, and this substrate chuck 1 is held, and as shown in drawing 1 , it is formed in the shape of a rectangle, while migration of X, Y, and the direction of theta is carried out with the above-mentioned trolley table 10. In addition, although the illustration abbreviation was carried out, two or more vacuum suction holes for carrying out adsorption maintenance of the above-mentioned rectangle substrate 2 are prepared in the top face of this substrate chuck 1 at proper spacing. Moreover, the above-mentioned rectangle substrate 2 is a large-

sized glass substrate beyond 400mmx500mm, and the periphery section has projected it outside the perimeter of the substrate chuck 1, as shown in drawing 1 and drawing 2 .

[0019] Optical system 11 is established above the above-mentioned substrate chuck 1. This optical system 11 is exposure optical system in a substrate aligner, is inspection optical system in substrate test equipment, and it is constituted so that a focus may be connected on the field of the rectangle substrate 2 by which installation maintenance is carried out on the top face of the substrate chuck 1.

[0020] Here, in this invention, near [each] each side of two sides of phase next door **** rectangular crosses of the rectangle substrate chuck 1 of the above, only predetermined distance separates mutually and edge sensor 3a, 3b;3c, and two 3d are arranged. These edge sensors 3a-3d are what detects optically the periphery of each side of two sides of phase next door **** rectangular crosses of the rectangle substrate 2 held on the top face of the above-mentioned substrate chuck 1. For example, along with the long side side of the above-mentioned rectangle substrate 2, first edge sensor 3a and second edge sensor 3b are prepared in the medial axis 12 of Y shaft orientations at the symmetry. Along with the shorter side side of this rectangle substrate 2, third edge sensor 3c and fourth edge sensor 3d are prepared in the medial axis 13 of X shaft orientations at the symmetry. As shown in drawing 2 , as the floodlighting section 14 and a light sensing portion 15 sandwiched the periphery section of the rectangle substrate 2, they have countered up and down, respectively, and each above-mentioned edge sensors 3a-3d operate by irradiating a laser beam downward from the above-mentioned floodlighting section 14, receiving light by the light sensing portion 15, and intercepting this exposure laser beam in the periphery of the above-mentioned rectangle substrate 2 so that that location may be detected.

[0021] in addition, the above-mentioned each edge sensor 3a, 3b;3c, cylinder 4a that was alike 3d, respectively and was attached, and 4b;4c -- the approach and evacuation to the rectangle substrate 2 are enabled by 4d like arrow heads A, B, C, and D. Moreover, pulse motor 5a, 5b;5c, and 5d are attached to each above-mentioned cylinder 4a, 4b;4c, and 4d, respectively, and scanning actuation for said edge sensor 3a, 3b;3c, and 3d to detect the periphery of the rectangle substrate 2 like an arrow head E, F;G, and H is enabled. Furthermore, the detecting signal detected by each above-mentioned edge sensor 3a, 3b;3c, and 3d is incorporated in the detector 6 shown in drawing 1 R> 1. In addition, this detector 6 is classified corresponding to each above-mentioned edge sensors 3a-3d, and delivers a detecting signal by 1 to 1.

[0022] Moreover, the data-processing control circuit 8 and the table drive control circuit 9 are established in the output side of the above-mentioned detector 6. The above-mentioned data-processing control circuit 8 inputs an each edge sensors [which were incorporated in the detector 6 / 3a-3d] detecting signal, and recognizes the location of the direction of X, and the direction of Y, and the include angle of the direction of theta about two sides of predetermined rectangular crosses of said rectangle substrate 2. While recognizing the amount of gaps to a predetermined target position, location amendment processing for making it into zero is performed, MPU, memory, etc. as a processing unit are prepared in the interior, and the amendment processing signal S1 is outputted. The amendment processing signal S1 outputted from the above-mentioned data-processing control circuit 8 is inputted, only the amount corresponding to this amendment processing signal S1 moves said trolley table 10 in X, Y, and the direction of theta, and the table drive control circuit 9 sends out the drive control signal S2 to the above-mentioned trolley table 10.

[0023] And a location amendment means to incorporate the position signal of the periphery of two sides of rectangular crosses of the rectangle substrate 2 detected by every two above-mentioned edge sensor 3a, 3b;3c, and 3d, to recognize the location of the direction of X and the direction of Y and the include angle of the direction of theta, and to amend a location to the target position of this rectangle substrate 2 in the above-mentioned data-processing control circuit 8 and the table drive control circuit 9 is constituted.

[0024] Next, actuation of the pointing device of the rectangle substrate by this invention constituted in this way is explained with reference to drawing 1 - drawing 3 . First, it takes out one rectangle substrate 2 at a time from the loader section by the robot hand of an illustration abbreviation, and conveys in a predetermined path, as an arrow head J shows to drawing 1 , it sends out, and it lays in the top face of the substrate chuck 1. At this time, as the rectangle substrate 2 shows drawing 3 to a predetermined target position by the variation by conveyance of the above-mentioned robot hand, a location gap may be caused.

[0025] Next, each edge sensor 3a shown in drawing 1 , 3b;3c, and 3d, from the condition of having approached the rectangle substrate 2 as shown in arrow heads A, B, C, and D, respectively, scanning actuation is carried out still like arrow heads E, F, G, and H, and the periphery of each side of two sides of rectangular crosses is detected optically. That is, as shown in drawing 3 , first edge sensor 3a detects a point P1 (x1, y1), second edge sensor 3b detects a point P2 (x2, y2), third edge sensor 3c detects a point P3 (x3, y3), and a point P4 (x4, y4) is detected edge sensor 3d of the fourth **. And such signal detection is performed in the detector 6 shown in drawing 1 .

[0026] When it is criteria Rhine which recognizes now angle-of-inclination theta [as opposed to X shaft orientations for the long side side of two sides of rectangular crosses of the rectangle substrate 2 shown in drawing 1], in this case The current position of X shaft orientations of the rectangle substrate 2 detected as shown in drawing 3 is set to (x3+x4) / 2 from the X coordinate of points P3 and P4, and the current position of Y shaft orientations is set to (y1+y2) / 2 from the Y coordinate of points P1 and P2. Moreover, similarly angle-of-inclination theta to X shaft orientations (sign 13 reference) of the medial axis 7 of this rectangle substrate 2 is from X of points P1 and P2, and Y coordinate,

$$\vartheta = \tan^{-1}\frac{y_1 - y_2}{x_1 - x_2} \quad \cdots (3)$$

It becomes. In addition, this formula (3) is completely the same as the above-mentioned formula (1).

[0027] Moreover, if the predetermined target position of the above-mentioned rectangle substrate 2 is made into the zero Q of a coordinate x0 by X shaft orientations and it is the zero R of a coordinate y0 by Y shaft orientations in drawing 1 As shown in drawing 3 , about the rectangle substrate 2 conveyed and laid, the amount of gaps of X shaft orientations is set to {x0- (x3+x4)/2}, and the amount of gaps of Y shaft orientations is set to {y0- (y1+y2)/2}. And angle-of-inclination theta to X shaft orientations of this rectangle substrate 2 is as an above-mentioned formula (3). What is necessary is just to make it this amount of gaps serve as zero, since the amount of gaps to the predetermined target position of the rectangle substrate 2 laid by above-mentioned carrying out conveyance by these is known.

[0028] Therefore, each above-mentioned amount of gaps is recognized in the data-processing control circuit 8 shown in drawing 1 , location amendment processing for making it into zero is performed, and the amendment processing signal S1 is sent out to the table drive control circuit 9. And this table drive control circuit 9 sends out the drive control signal S2 to the trolley table 10 (refer to drawing 2) which is supporting said substrate chuck 1, and only the amount corresponding to the above-mentioned amendment processing signal S1 moves in the direction of X, and the direction of Y, and it makes a list rotate this trolley table in the direction of theta. Thereby, in drawing 1 , while the periphery of two sides of rectangular crosses of the above-mentioned rectangle substrate 2 is in agreement with Zeros Q and R, respectively, it becomes zero, and an inclination also agrees in a predetermined target position and is positioned in it.

[0029] Next, the case where it is specified as criteria Rhine which recognizes angle-of-inclination theta [as opposed to X shaft orientations for the shorter side side of two sides of rectangular crosses of the above-mentioned rectangle substrate 2] by demand of a user unlike an above-mentioned case is explained. Since every two edge sensor 3a, 3b;3c, and 3d are beforehand prepared in the long side [of two sides of rectangular crosses of the rectangle substrate 2], and shorter side side unlike the former at this time as shown in drawing 1 R> 1, it is not necessary to reshuffle the personnel especially by the design change. Therefore, each edge sensor 3a, 3b;3c, and 3d detect optically the periphery of each side of two sides of rectangular crosses of the rectangle substrate 2 like last time. The current position of X shaft orientations of the rectangle substrate 2 detected as shown in drawing 3 also in this case is set to (x3+x4) / 2 from the X coordinate of points P3 and P4, and the current position of Y shaft orientations is set to (y1+y2) / 2 from the Y coordinate of points P1 and P2. Moreover, for angle-of-inclination theta to X shaft orientations (sign 13 reference) of the medial axis 7 of this rectangle substrate 2, next time is from X of the points P3 and P4 describing above, and Y coordinate,

$$\theta = \tan^{-1}\frac{x_3 - x_4}{y_3 - y_4} \quad \cdots (4)$$

It becomes. Namely, what is necessary is just to use it for third edge sensor 3c and fourth edge sensor 3d in this case, switching as an object for detection of angle-of-inclination theta.

[0030] Also in this case, if the predetermined target position of the above-mentioned rectangle substrate 2 is made into the zero Q of a coordinate x0 by X shaft orientations and it is the zero R of a coordinate y0 by Y shaft orientations in drawing 1 Like [substrate / 2 / which was conveyed and laid as shown in drawing 3 / rectangle] the above-mentioned, the amount of gaps of X shaft orientations is set to {x0- (x3+x4)/2}, and the amount of gaps of Y shaft orientations is set to {y0- (y1+y2)/2}. And angle-of-inclination theta to X shaft orientations of this rectangle substrate 2 is as an above-mentioned formula (4). Since the amount of gaps to the predetermined target position of the rectangle substrate 2 laid by above-mentioned carrying out conveyance by these is known, location amendment processing is performed like the above-mentioned in the data-processing circuit 8 and the table drive control circuit 9 so that this amount of gaps may serve as zero. Thereby, it is agreed and positioned in a predetermined target position.

[0031] As mentioned above, according to the pointing device of the rectangle substrate by this invention, every two above-mentioned edge sensor 3a, 3b;3c, and a 3d group can be used by whether which side of two sides of rectangular crosses of this rectangle substrate 2 is taken as criteria Rhine which recognizes the include angle of the direction of theta of the target rectangle substrate 2 to position, switching them mutually, and recognition and amendment of the rectangle substrate 2 of the include angle of the direction of theta can be carried out.

[0032] In addition, in the above explanation, although each edge sensors 3a-3d were made into the photo sensor of the transparency mold which isolated between predetermined and the floodlighting section 14 and a light sensing portion 15 were made to counter up and down, this invention is good [the edge sensors] also as a photo sensor of the reflective mold which adjoins and forms not only this but the floodlighting section 14, and a light sensing portion 15 in the same side side of the rectangle substrate 2, and received the reflected light. Moreover, without being limited to this, it fixes to the home position where the rectangle substrate 2 should position each above-mentioned edge sensors 3a-3d, and it moves the above-mentioned substrate chuck 1, and you may make it amend the location of the above-mentioned rectangle substrate 2 in drawing 1 , although the substrate chuck 1 does not move greatly, but moves each edge sensors 3a-3d to the rectangle substrate 2 side and he is trying to detect the periphery.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the flat-surface explanatory view seen from the top-face side of the rectangle substrate in which the operation gestalt of the pointing device of the rectangle substrate by this invention is shown.
[Drawing 2] It is the transverse-plane explanatory view which looked at the substrate chuck from the transverse-plane side.
[Drawing 3] It is the flat-surface explanatory view showing positioning actuation of a rectangle substrate.
[Drawing 4] It is the flat-surface explanatory view seen from the top-face side of the rectangle substrate in which the pointing device of the rectangle substrate by the conventional example is shown.
[Drawing 5] It is the flat-surface explanatory view showing positioning actuation of the rectangle substrate corresponding to criteria Rhine of a certain user demand in the conventional example.
[Drawing 6] It is the flat-surface explanatory view showing positioning actuation of the rectangle substrate corresponding to criteria Rhine of other user demands in the conventional example similarly.
[Description of Notations]
1 -- Substrate chuck
2 -- Rectangle substrate
3a-3d -- Edge sensor
4a-4d -- Cylinder
5a-5d -- Pulse motor
6 -- Detector
8 -- Data-processing control circuit
9 -- Table drive control circuit
10 -- Trolley table
11 -- Optical system
14 -- Floodlighting section
15 -- Light sensing portion

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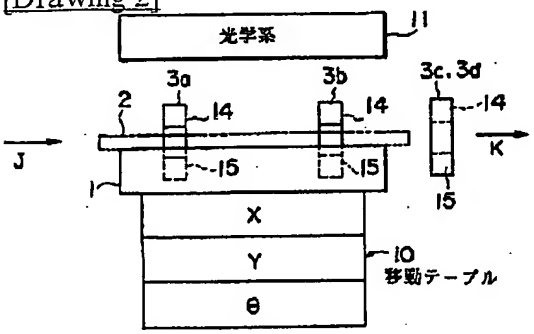
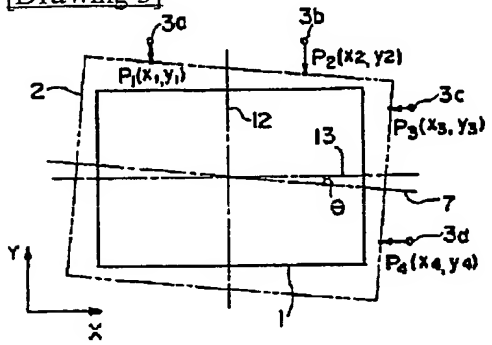
DRAWINGS

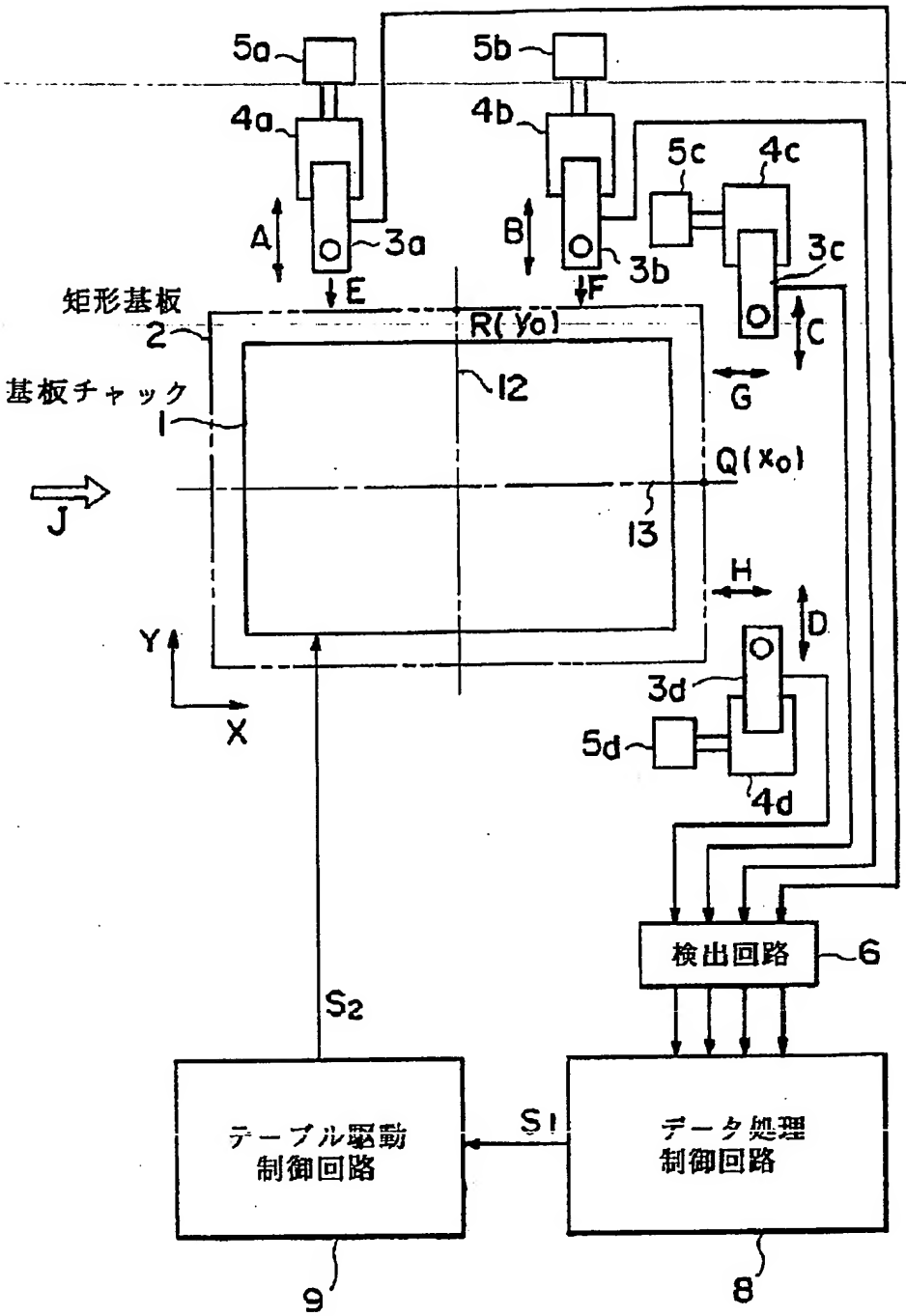
[Drawing 2]



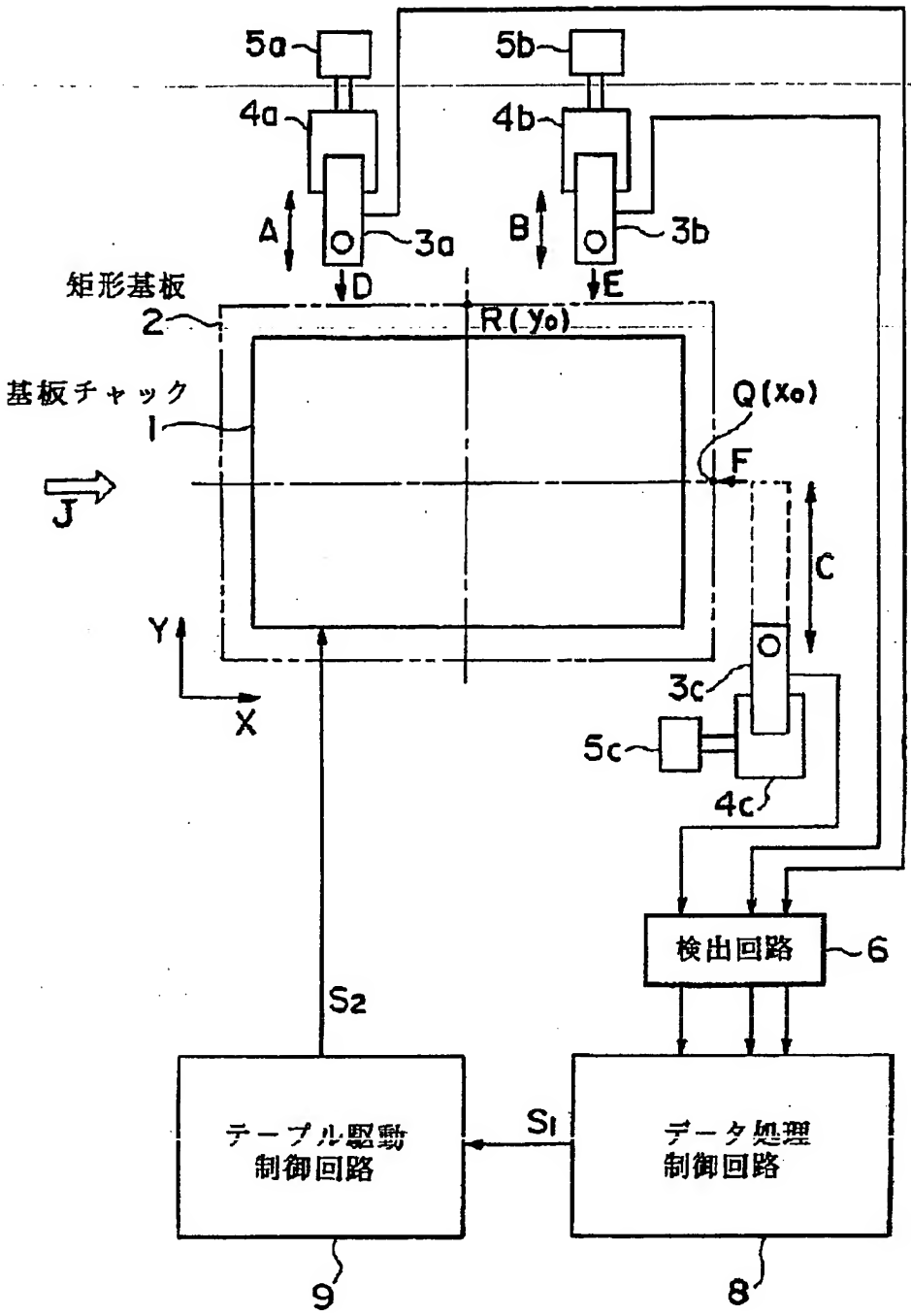
[Drawing 3]



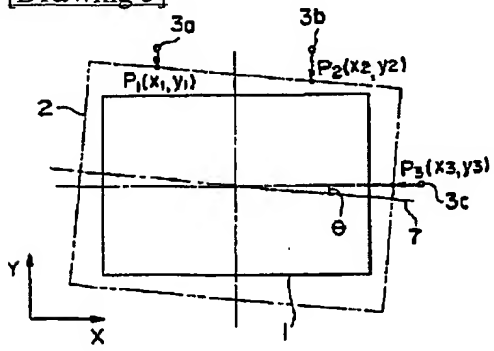
[Drawing 1]


5a
5b
4a
4b
5c
4c
A
3a
B
3b
3c
E
F
矩形基板
2
R(Yo)
C
基板チャック
1
12
G
Q(Xo)
J
13
H
D
Y
X
3d
5d
4d
検出回路
6
S2
テーブル駆動
制御回路
S1
データ処理
制御回路
9
8

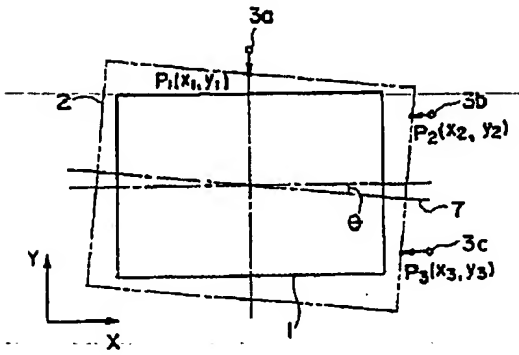
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]